Creating International Safeguards Against Weapons of Mass Destruction

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INTRODUCTION

The post-cold war national security era is a period of asymmetry and the practical manifestations of this asymmetry are becoming clear — witness the terrorist use of *Bacillus anthracis.* The biological threat observes no societal distinctions and geographic boundaries are becoming less of an impediment to disease transmission. The once clear, bright lines between the biological threat from military application of biological warfare agents and natural disease outbreaks are becoming blurred — all society is and feels at risk from the biological threat. This greater appreciation and fear by the general public of the biological threat poses many challenges. However, it also creates new opportunities for addressing the natural and terrorist biological threats with common tools. Converging advances in several technologies (e.g., communication systems, computational science, sensors) creates further opportunity for generically addressing the biological threat. This paper carries this argument forward in the context of international safeguards for managing the biological threat.

The dynamic tension between host and pathogen has shaped the existence of individuals, populations, and societies throughout history. For a brief period in this past century, the false perception was created that human kind had achieved control of the host-pathogen relationship through technological means (e.g., antibiotics, immunizations). The advent of new diseases such as AIDS, development and rapid spread of antibiotic resistance, and growing experience with emerging infectious diseases has brought into clear perspective, the on-going nature of the relationship between host and pathogen. Concurrent to our growing understanding of the "natural" biological threat, the implications of an anthropogenic facilitated biological threat (e.g., bioterrorism) is taking form like a dark cloud over society.

NATURE OF THE BIOLOGICAL THREAT

Significant fundamental differences exist between the biological threat and other weapons of mass destruction. These differences are self-evident and have been discussed in numerous review articles, so only a listing of the most significant differences is provided. However, the implications of these simply stated facts are great.

- Biological agents multiply rapidly, often on simple media. Therefore, monitoring agent stockpiles is of limited value.

- Pathogens are ubiquitous in nature. Therefore, a "bright line" distinction between natural and terrorist events is difficult, and the majority of unusual events will be of natural origin.

- Biotechnology is pursued for many purposes in almost all countries. Therefore, the tools of bioterrorism are dual use and widely available.

- The United States and allies have little understanding of today's biothreat due to the lack of an offensive program and few operational experiences. Therefore, our ability to prepare and respond is impaired.

- Rapid advances in technologies that can increase the threat from bioterrorism are being strongly driven by economic, humanitarian, and scientific interests. Therefore, biothreat technological surprise is probable.

The threat from biological agents is extremely diverse, with great uncertainty and in many instances, of horrific impact to society. No single point of threat management will be 100 percent efficacious for the foreseeable future. Therefore, the full spectrum of intervention opportunities must be pursued in hopes of managing the biological threat to an acceptable level. This paper briefly describes the history, status, and opportunities for managing the biological threat through international safeguards, with particular emphasis on the Biological Weapons Convention.

Biological threat encompasses all ramifications of the effects of pathogens on individuals and society. Pathogens that attack humans, crops, and animals are included in this large group of potential biological threat agents, which includes viruses, bacteria, fungi, and their toxic products. While pathogens share a common ability to adversely affect a host species, their physical and biological properties, host-to-host transmission, and mechanistic approaches to pathogenesis are very diverse.

The diverse groups of pathogens that have potential for bioterrorist application create a very wide range of employment opportunities and proliferation signatures. The spectrum of employment concepts spans large-scale aerosol release, employing kilograms of material disseminated from aircraft to use on people infected with highly contagious

pathogens. The physical and operational signatures required to support such diverse concepts of employment, strain traditional intelligence and treaty monitoring systems.

The above facts conspire to limit the utility of traditional approaches to non- and counter-proliferation. Limiting the availability of biothreat agent seed cultures, identifying, labeling, counting, and monitoring biological weapons, and attempting verification of treaty compliance (assuming practical definitions could be agreed upon) are of very limited utility. Indeed, traditional approaches to managing the WMD threat can interfere with pursuit of critical medical research, public health activities, and industrial sectors.

BIOLOGICAL WEAPONS CONVENTION

International safeguards have enjoyed varying levels of success in preventing the proliferation of weapons of mass destruction/effect. The Biological Weapons Convention (BWC) entered into force in 1975, with 162 signatory states. As stated in Article I of the BWC:

"Each State Party to this Convention undertakes never in any circumstances to develop, produce, stockpile or otherwise acquire or retain:

(1) Microbial or other biological agents, or toxins, whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes;

(2) Weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict."

The BWC has been criticized for lack of clarity and enforcement mechanism. In reality, the authors prepared a document that acknowledged the inherent limitations associated with controlling biological weapons. The nature of biological weapons has not changed and the occurrence of confounding associated factors (e.g., wide spread availability of dual use technology, natural occurrence of potential agents, widespread use of potential agents for peaceful purposes) has increased. Despite the advances in monitoring and on-site inspection technologies (i.e., molecular forensics), verification of compliance is not achievable. Today, as in 1975, assessing BWC compliance depends on assessing intent.

In retrospect, attempts to develop a legally binding protocol to strengthen the BWC were doomed from the beginning. On a positive note, the protracted negotiation process over the past decade has served to create a small community of knowledgeable professionals and sharpened the understanding and appreciation of such divergent concepts as verification versus transparency. The most recent Review Conference ended without prospect for establishing a legally binding protocol. The issues on the negative side of the ledger (i.e., protecting commercial intellectual property and national security information and the cost of developing and maintaining a monitoring body) overwhelmed the meager perceived value of a protocol.

The two most recent and instructive case studies of the inability of the international community to monitor and respond to the proliferation of biological weapons are the Tri-Lateral process between the United States/United Kingdom and Former Soviet Union and the UNSCOM experience in Iraq. Reviews of these case studies have been published. The clear conclusion is that international monitoring is not effective in detection of a biological weapons program. The FSU and Iraq programs were both large-scale efforts to produce and deploy militarily significant quantities of biological weapons. If such military-level efforts cannot be detected by intrusive international monitoring, there is little hope of detecting the minimal signature associated with terrorist production and development of biological weapons.

A WAY-AHEAD FOR INTERNATIONAL SAFEGUARDS

The above facts suggest that there is little value to be gained in pursuing development of international safeguards. However, a shift in focus from the narrow view of controlling states parties' biological warfare programs to one of dealing with the overall biological threat (natural, states parties, and terrorist) opens up new possibilities. This greater area of impact and resulting societal interest (i.e., direct financial, public health, and national security impacts) provides a broader base from which value may be derived. In addition, the newly evoked broad societal concern over the biological threat can serve to bring greater attention to the problem and generate political will for applying needed resources.

Many concepts that were discarded during the BWC discussions may find new appeal in the current national and international climate. Such concepts include increasing transparency and establishing and promulgating international norms. The Honorable John R. Bolton, head of the United States delegation, in his address to the Fifth Review Conference of the BWC suggests a way ahead that includes greater consultation and cooperation (Article V), assistance to victims (Article VII), and technical and scientific cooperation (Article X). In line with the United States suggested way ahead, I see the greatest opportunity exists in leveraging dual-use applications; the same dual-use technology and infrastructure that precluded formulation of clear definitions that eventually undermined efforts to develop a BWC protocol. One such approach would be to establish an international health information reporting and management system.

The current political climate, public concern over infectious disease, and technological advances may offer the opportunity to accelerate development of the next major advance in public health — global surveillance, enhanced public health planning, and response. The international communication infrastructure is rapidly expanding. Computational science is focused on managing and analyzing large amounts of complex data. Pathogen genomes are being sequenced, annotated, and archived. Advances in sensor technology and robotics are driving down the cost of laboratory analysis and providing less complex analysis platforms for use outside the laboratory. Convergence of these capabilities holds the promise of establishing a public health information network that is continually

monitoring infectious disease and queuing for anomalous disease incidence. Such a system would be of great value for monitoring and managing existing public health challenges, give early warning of emerging pathogens to enable effective planning and response, and identify unusual disease outbreaks.

Establishing and operating a global public health network is technically feasible today. Several related rudimentary systems are already in widespread use, which are focused on specific pathogens or transmission modes. Connecting the existing monitoring programs into a Federated Surveillance Network would be a powerful step forward in establishing international safeguards against all sources of the biological threat.

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Prior to coming to Los Alamos National Laboratory, Gary worked at the Defense Threat Reduction Agency, at the U.S. Army Dugway Proving Ground, in Utah, and at the U.S. Environmental Protection Agency in Rhode Island. He holds a B.S. degree from Cornell University, a M.S. degree from Long Island University and a Ph.D. in Microbiology from University of Rhode Island.